POLYELECTROLYTE'S: SWELLING: CROSS-LINKING: DRUG-BINDING/RELEASE

Polymer science:
Polymers are important in industrial applications (food, detergents, paint etc.) and within medical research as drug carriers. Polymers obtain distinct phases in solution and on surfaces, for example micelles or ordered films. The different structural phases of the molecules are closely related to their function.

Displacements of charged groups or re-structuring in an adsorbed or grafted polymer film give rise to a change of their insulating properties. This is seen as a change in sensor surface capacitance. Impedance measurement is independent of molecular mass but sensitive to structural and chemical properties of a molecular film, thus impedance measurements give important complementary information to mass-sensitive techniques.

Dendrimeric polymers are used as dug-carriers and their properties under different conditions are thoroughly investigated. In Fig. 1 the viscous properties of 5 generations (G1-5) of dendrimers are studied, and for the last generation it becomes evident that the film structure has collapsed. In Fig. 2 the adsorption of a G4 dendrimer to a gold sensor surfaces is illustrated.

In Fig. 3 a sensor surface has been spin-coated with PMMA, and the swelling of the polymer is seen as a decrease in surface capacitance, as more buffer is excluded from the surface.

z-LAB and Polymers:

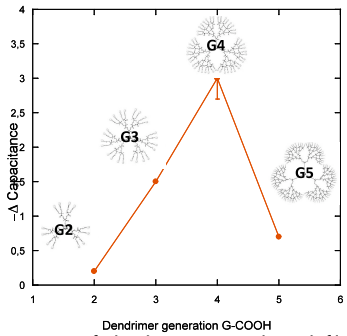

Fig. 1 Measurement of dendrimer growth and film structure collapse using z-LAB system.

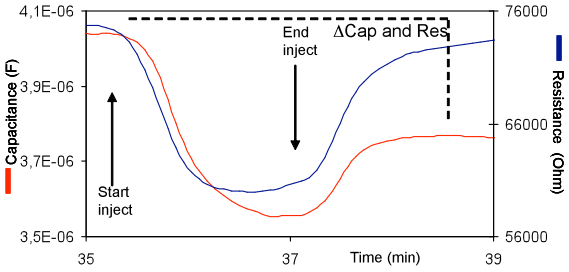

Fig. 2 A gold sensor surface is coated with a G4-dendrimer and the process is monitored using the z-LAB system.

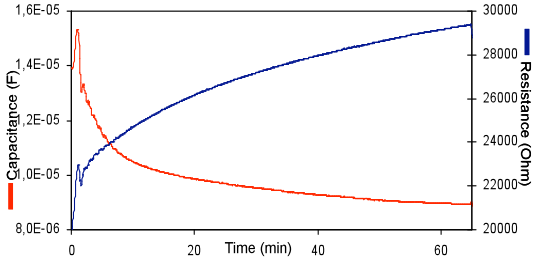

Fig. 3 Monitoring of polymer film swelling seen as a decrease in sensor surface Capacitance and an increase in Resistance using the z-LAB system.

Conclusion

Complex impedance measurements with the z-LAB technology are well suited to address questions related to polymer interactions and structural properties on different surfaces and can be applied for technical and fundamental research and development. The mass of adsorbed polymer films does not change during phase transition, but the inherent properties can be enormously different. Impedance measurement is independent of molecular mass but sensitive to structural and chemical properties of a molecular film. The z-LAB system can provide important complementary information to mass-sensitive techniques.

Reference: The dendrimer study is to be published under 2010